AF CN

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: Robert S. Lewandowski et al.	§		
	§	Group Art Unit:	3662
Serial No.: 10/814,956	§		
	§	Examiner:	Ian J. Lobo
Filed: March 31, 2004	§		
For: METHOD AND MEANS FOR ISOLATING ELEMENTS OF A SENSOR ARRAY	§	Atty. Docket:	126956-6/YOD GERD:0607

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATE OF MAILING
37 C.F.R. 1.8

I hereby certify that this correspondence is being deposited with the U.S. Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Mail Stop Appeal Brief-Patents, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the date below:

March 29, 2007 Lynda Howell
Date

APPEAL BRIEF PURSUANT TO 37 C.F.R. §§ 41.31 AND 41.37

This Appeal Brief is being filed in furtherance to the Notice of Appeal mailed on January 28, 2007, and received by the Patent Office on January 29, 2007.

The Commissioner is authorized to charge the requisite fee of $500.00, and any additional fees which may be necessary to advance prosecution of the present application, to Account No. 07-0868, Order No. 126956-6-1/YOD (GERD:0607).

04/02/2007 SSESHE1 00000066 070868 10814956
01 FC:1402 500.00 DA

1. **REAL PARTY IN INTEREST**

The real party in interest is General Electric Company, the Assignee of the above-referenced application by virtue of the Assignment to General Electric Company by Robert Stephen Lewandowski, Lowell Smith, Douglas Wildes, Charles Baumgartner, Rayette Ann Fisher, George Sogoian, and David Mills, recorded at reel 014620, frame 0352, and dated May 11, 2004. Accordingly, General Electric Company will be directly affected by the Board's decision in the pending appeal.

2. **RELATED APPEALS AND INTERFERENCES**

Appellants are unaware of any other appeals or interferences related to this Appeal. The undersigned is Appellants' legal representative in this Appeal.

3. **STATUS OF CLAIMS**

Claims 1-10, 12, 35-37 and 39 are currently pending, are currently under final rejection and, thus, are the subject of this Appeal. Claims 11, 18-34, 38 and 45-50 were earlier cancelled, and claims 13-17 and 40-44 stand withdrawn.

4. **STATUS OF AMENDMENTS**

There are no outstanding amendments to be considered by the Board.

5. **SUMMARY OF CLAIMED SUBJECT MATTER**

The present invention relates generally to the field of sensor arrays. *See,* Application page 1, line 4. More particularly, the present invention relates to micromachined ultrasonic transducers (MUTs).

Acoustic energy generated using a capacitive micromachined ultrasonic transducer device does not rely on a piezoelectric material to generate ultrasonic energy. Rather, the basic structure of a cMUT cell is that of a conductive membrane or diaphragm suspended above a conductive electrode by a small gap. When a voltage is applied between the membrane and the electrode, Coulombic forces attract the membrane to the

electrode. *See,* Application page 3, lines 20-25. The cMUT device is typically built with multiple membranes per transducer element. A complete transducer probe used for medical imaging, non-destructive evaluation or some other imaging device comprises multiple transducer elements arranged in a row or rows to form an array, each element comprising a plurality of cMUT cells having their electrodes electrically connected together. Each element of the array needs to act independently from its neighbors. Since the array of transducer elements is built on a common substrate, the problem exists that there will be both electrical and mechanical interference between neighboring elements (i.e., crosstalk). *See,* Application, page 3, lines 32-35 and page 4, lines 1-5.

The above discussed and other drawbacks and deficiencies of the prior art are overcome or alleviated by an array of sensors that have isolation between the transducer elements. The Application contains two independent claims, namely, claims 1 and 35, both of which are the subject of this Appeal. The subject matter of these claims is summarized below.

With regard to the aspect of the invention set forth in independent claim 1, discussions of the recited features of claim 1 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with the present invention relates to a sensor device (*e.g.*, 20). *See, e.g., id.* at page 9, lines 6-7. The sensor device comprises a multiplicity of sensor elements (*e.g.*, 2). *See, e.g., id.* at page 15, lines 19-20. The sensor elements arranged at a front surface of a substrate (*e.g.*, 4). *See, e.g., id.* at page 10, lines 21-22; *see also,* FIG. 1. Each of the sensor elements is in contact with material of the substrate, and a multiplicity of barriers (*e.g.*, 38) are arranged in the material of the substrate to reduce the coupling of a form of energy between any of the sensor elements, each barrier posing an obstacle to the propagation of the form of energy impinging thereon. The multiplicity of barriers extend into the material of the substrate but not completely through the material of the substrate. *See, e.g., id.* at page 13, lines 1-4; *see also,* FIG. 6. The barriers and adjoining portions of

the substrate are coated with a thin layer of insulating material. *See, e.g., id.* at page 13, lines 22-26.

With regard to the aspect of the invention set forth in independent claim 35, discussions of the recited features of claim 35 can be found at least in the below cited locations of the specification and drawings. By way of example, an embodiment in accordance with the present invention relates to an ultrasonic transducer device (*e.g.*, 20). *See, e.g., id.* at page 9, lines 6-7. The ultrasonic transducer device comprises a multiplicity of ultrasonic transducer elements. *See, e.g., id.* at page 15, lines 19-20. The transducer elements are arranged at a front surface of a substrate (*e.g.*, 4). *See, e.g., id.* at page 10, lines 21-22. Each of the transducer elements comprises a respective group of ultrasonic transducer cells (*e.g.*, 2). *See, e.g., id.* at page 10, lines 1-3; *see also*, FIG. 4. The cells are electrically connected together and acoustically coupled to the substrate (*e.g.*, 4). *See, e.g., id.* at page 10, lines 21-22, *see also*, FIG. 1. The cells are also acoustically coupled to a multiplicity of trenches (*e.g.*, 26). *See, e.g., id.* at page 11, lines 6-9; *see also*, FIG. 6. The trenches are disposed in areas between the transducer elements, and the trenches obstruct the propagation of acoustic wave energy therethrough. The multiplicity of trenches extend into the material of the substrate but not completely through the material of the substrate. *See, e.g., id.* at page 13, lines 1-4; *see also,* FIG. 6. The trenches and adjoining portions of the substrate are coated with a thin layer of insulating material. *See, e.g., id.* at page 13, lines 22-26.

A benefit of the invention, as recited in these claims, is providing a barrier between transducer elements, where each barrier poses an obstacle to the propagation of the form of energy impinging thereon. *See, e.g., id.* at page 4, lines 24-25.

6. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

First Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's first ground of rejection in which the Examiner rejected claims 12 and 39 under 35 U.S.C. §

112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellants regard as the invention.

Second Ground of Rejection for Review on Appeal:

Appellants respectfully urge the Board to review and reverse the Examiner's second ground of rejection in which the Examiner rejected claims 1-10, 12, 35-37 and 39 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 6,262,946 (hereinafter "Khuri-Yakub") in view of U.S. Patent 6,669,644 (hereinafter "Miller") and U.S. Patent 6,051,868 (hereinafter "Watanabe").

7. ARGUMENT

As discussed in detail below, the Examiner has improperly rejected the pending claims. Further, the Examiner has misapplied long-standing and binding legal precedents and principles in rejecting the claims under Sections 112 and 103. Accordingly, Appellants respectfully request full and favorable consideration by the Board, as Appellants strongly believe that claims 1-10, 12, 35-37 and 39 are in condition for allowance.

A. Ground of Rejection No. 1:

The Examiner rejected claim 1 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellants regard as the invention.

The Examiner's focus during examination of claims for compliance with the requirement for definiteness of 35 U.S.C. 112, second paragraph, is whether the claim meets the threshold requirements of clarity and precision, not whether more suitable language or modes of expression are available. *See* M.P.E.P. § 2173.02. Although the Examiner may take exception to the terms used in the claims, the patentee may be his own lexicographer. *Ellipse Corp. v. Ford Motor Co.*, 171 U.S.P.Q. 513 (7th Cir. 1971), *aff'd.* 613 F.2d 775 (7th Cir. 1979), *cert. denied*, 446 U.S. 939 (1980). The Examiner is

also reminded not to equate breadth of a claim with indefiniteness. *In re Miller*, 441 F.2d 689, 169 U.S.P.Q 597 (CCPA 1971).

The essential inquiry pertaining to the definiteness requirement is whether the claims set out and circumscribe a particular subject matter with a reasonable degree of clarity and particularity. *See* M.P.E.P. § 2173.02. As set forth in Section 2173 of the Manual of Patent Examining Procedure, definiteness of claim language must be analyzed, not in a vacuum, but in light of:

(A) The content of the particular application disclosure;
(B) The teachings of the prior art; and
(C) The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made.

In reviewing a claim for compliance with 35 U.S.C. 112, second paragraph, the Examiner must consider the claim as a whole to determine whether the claim apprises one of ordinary skill in the art of its scope and, therefore, serves the notice function required by 35 U.S.C. 112, second paragraph, by providing clear warning to others as to what constitutes infringement of the patent. *See Solomon v. Kimberly-Clark Corp.*, 216 F.3d 1372, 1379, 55 U.S.P.Q.2d 1279, 1283 (Fed. Cir. 2000). Only when a claim remains insolubly ambiguous without a discernible meaning after all reasonable attempts at construction must a court declare it indefinite. *See Metabolite Labs., Inc. v. Lab. Corp. of Am. Holdings*, 370 F.3d 1354, 1366, 71 U.S.P.Q.2d 1081, 1089 (Fed. Cir. 2004). Accordingly, a claim term that is not used or defined in the specification is not indefinite if the meaning of the claim term is discernible. *See Bancorp Services, L.L.C. v. Hartford Life Ins. Co.*, 359 F.3d 1367, 1372, 69 U.S.P.Q.2d 1996, 1999-2000 (Fed. Cir. 2004).

First, Appellants submit that the terminology "electrically conductive material that is grounded to electrically isolate one sensor element from the next" recited in claims 12 and 39 sets out and circumscribes the claimed subject matter with a reasonable degree of clarity and particularity. In fact, it appears that the Examiner is confusing claim breadth with indefiniteness. The element of "electrically conductive material that is

grounded to electrically isolate one sensor element from the next" is explained in detail on page 15, paragraph 2, lines 6-16 of the application:

> Alternatively, a primarily non-conductive substrate could be used for cMUT fabrication where the bottom electrode would be either deposited metal or selectively doped regions under the cMUT. In this case, it may be desirable to ground the regions between each element by selectively doping these regions and electrically grounding them. Another method of grounding the regions between elements that are separated with isolation trenches (as previously described) would be to coat a surface (*e.g.*, the walls) of the trenches with an electrically conductive material, such as aluminum or an aluminum-silicon alloy, and then connect this metal to ground to electrically isolate one element from the next. Either method would allow stray charges to be conducted to ground rather than to neighboring elements.

In view of the original application, including the passage cited above, the recitation "electrically conductive material that is grounded to electrically isolate one sensor element from the next" can be readily identified and understood by one of ordinary skill in the art. Thus, the "electrically conductive material that is grounded to electrically isolate one sensor element from the next" is not indefinite as suggested by the Examiner.

Secondly, Appellants submit that in view of the original application, including the passage cited above, recitation of the element "electrically conductive material that is grounded to electrically isolate one sensor element from the next" in claims 12 and 39 does further limit the subject matter of claims 1 and 35, respectively, and more specifically, does not appear to contradict the independent claims as suggested by the Examiner.

For these reasons among others, the Appellants respectfully request withdrawal of the foregoing rejections under 35 U.S.C. § 112, second paragraph.

B. **Ground of Rejection No. 2:**

The Examiner rejected claim 11 under 35 U.S.C. § 103(a) as being unpatentable over Khuri-Yakub in view of Miller and Watanabe.

1. **Judicial precedent has clearly established a legal standard for a *prima facie* obviousness rejection.**

The burden of establishing a *prima facie* case of obviousness falls on the Examiner. *Ex parte Wolters and Kuypers*, 214 U.S.P.Q. 735 (B.P.A.I. 1979). Obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention absent some teaching or suggestion supporting the combination. *ACS Hospital Systems, Inc. v. Montefiore Hospital*, 732 F.2d 1572, 1577, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). Accordingly, to establish a *prima facie* case, the Examiner must not only show that the combination includes all of the claimed elements, but also a convincing line of reason as to why one of ordinary skill in the art would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972 (B.P.A.I. 1985). When prior art references require a selected combination to render obvious a subsequent invention, there must be some reason for the combination other than the hindsight gained from the invention itself, i.e., something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination. *Uniroyal Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 U.S.P.Q.2d 1434 (Fed. Cir. 1988).

2. **The Examiner's rejection of independent claim 11 is improper because the rejection fails to establish a *prima facie* case of obviousness.**

Independent claim 1 recites:

> A sensor device comprising:
> a multiplicity of sensor elements arranged at a front surface of a substrate, each of said sensor elements being in contact with material of said substrate; and
> a multiplicity of barriers arranged in said material of said substrate to reduce the coupling of a form of energy

between any of said sensor elements, each barrier posing an obstacle to the propagation of said form of energy impinging thereon, wherein the multiplicity of barriers extend into said material of said substrate but not completely through said material of said substrate, and wherein said barriers and adjoining portions of said substrate are coated with a thin layer of insulating material.

Independent claim 35 recites:

An ultrasonic transducer device comprising:
a multiplicity of ultrasonic transducer elements arranged at a front surface of a substrate, each of said transducer elements comprising a respective group of ultrasonic transducer cells electrically connected together and acoustically coupled to said substrate; and
a multiplicity of trenches in said material of said substrate, said trenches being disposed in areas between said transducer elements, and said trenches obstructing the propagation of acoustic wave energy therethrough, wherein the multiplicity of trenches extend into said material of said substrate but not completely through said material of said substrate, and wherein said trenches and adjoining portions of said substrate are coated with a thin layer of insulating material.

a. Features of Independent Claims 1 and 35 Omitted from Cited References

The Examiner relied upon Khuri-Yakub to teach the claimed sensor device, including a multiplicity of sensor elements arranged on the front surface of a substrate. Additionally, the Examiner relied upon Khuri-Yakub to teach a barrier arranged in the substrate material to reduce the coupling of a form of energy between any of the sensor elements. Further, the Examiner acknowledged that Khuri-Yakub does not teach or suggest a multiplicity of barriers. The Examiner relied upon Miller to teach a sensor device where a plurality of sensor elements are arranged on a substrate, where the substrate has a plurality of barriers or trenches for reducing coupling energy between sensor elements. The Examiner further argued that Miller is believed to teach a sensor

device where a plurality of sensor elements are arranged on a substrate. The substrate has a plurality of barriers or trenches for reducing coupling energy between sensor elements.

Appellants respectfully submit that the claims require that *barriers or trenches do not extend completely through the substrate material.* As described in the present application, each of the barriers or trenches starts at the front surface of the substrate and has a depth less than a thickness of the substrate as depicted in the embodiment illustrated in FIG. 6. Support for this interpretation may be found at least in a passage at lines 6-16 of page 11 of the application. Moreover, in the embodiment illustrated in FIG. 8 of the application, each of the barriers and trenches starts at a rear surface of the substrate and has a depth less than a thickness of the substrate. Further support for this aspect of the claimed arrangement may be found at least in a passage at lines 5-11 of page 13 of the application.

In contrast, as depicted in FIGS. 2-5 of Miller, a plurality of holes (215, 315, 415, 515) are etched through the MUT substrate 220 proximate to each MUT cell 216. In particular, each via 215 is etched *completely through* the MUT substrate 220, thereby creating voids in the MUT substrate 220, as discussed, *inter alia*, in a passage at col. 3, lines 36-46 of Miller. Additionally, Appellants also wish to bring to the Board's attention that Miller teaches doping each of the vias 215 to be electrically conductive. Each of the electrically conductive vias 215 is then employed to electrically connect a MUT element 210 to associated circuitry, as discussed, *inter alia*, at col. 3, lines 49-58 of Miller.

> It is merely an assumption on the Examiner's part that the vias of Miller are functional equivalents of the barriers claimed. The vias as suggested in Miller, are conductive holes, which are employed to electrically connect MUT elements. In contrast, as recited in a passage at page 4, lines 22-25 of the present application, the claimed barriers in the barriers and trenches of the present application are employed to obstruct the propagation of the energy.

Furthermore, in contrast to the conductive vias of Miller, each of the claimed barriers and trenches and adjoining portions of the substrate may be coated with a thin layer of insulating material, as discussed, *inter alia*, in the passage at lines 1-7 of page 14 of the application.

Accordingly, Miller teaches a plurality of holes (vias 215) that are etched completely through the MUT substrate 220, while the present claims relate to structures in which barriers or trenches are formed such that *each of the barriers or trenches starts at the front surface or the back surface of the substrate and has a depth less than a thickness of the substrate.* Additionally, each of the barriers of trenches is coated with an insulating material. In other words, Appellants respectfully submit that there is simply no similarity between the vias 215, 315, 415, 515 of Miller and the multiplicity of barriers recited in the claims. For at least this reason, the hypothetical combination of references fails to read on all the features of the claimed invention.

b. Watanabe may not be fairly combined with Khuri-Yakub

First, as noted above, Miller teaches vias that extend *completely through* the substrate. This is clearly exactly what claims 1 and 35 exclude. Accordingly, Appellants contend that Miller either cannot possibly support a *prima facie* case of obviousness, or at the very least, that the proposed combination would be antithetical to Miller's clear teachings.

Moreover, the Examiner relied on Watanabe solely for its disclosure of a semiconductor device wherein trenches are also coated with silicon oxide or silicon nitride (insulators) for reducing cross talk. Appellants respectfully observe that Watanabe relates to a semiconductor device, and more particularly relates to a semiconductor device comprising a high-speed analog circuits connecting to multiple-power supplies and specific structures capable of reducing cross talk originating in these analog circuits. Specifically, Watanabe discloses a principle of operation wherein

electric potentials of high concentration n-type layers are stabilized at a fixed value by supply of power through electrodes mounted on the these layers in order to prevent cross talk.

In a complete contrast, Khuri-Yakub relates to capacitive micromachined ultrasonic transducers to minimize the excitation and propagation of plate waves and ultrasonic waves.

Moreover, Watanabe discloses the use of trenches to reduce cross-talking only in context of *separating transistors* unlike in context of *separating transducer arrays* as disclosed by Khuri-Yakub. Appellants respectfully submit that it would be improper to modify the transducer-based system of Khuri-Yakub to include trenches as disclosed by Watanabe, because such a modification would change the principle of operation of Khuri-Yakub. In fact, it would require a substantial redesign of Khuri-Yakub to incorporate trenches, and it would render the transducer-based system of Khuri-Yakub inoperable for its intended purpose.

For the foregoing reasons, Appellants respectfully submit that Khuri-Yakub and Watanabe teach contrastingly different intended purposes and principles of operation, which would change if the cited references were hypothetically combined as suggested by the Examiner. As summarized above, a proposed modification or combination of references is entirely improper and insufficient to support a *prima facie* case of obviousness, where the proposed modification or combination would change the principle of operation of the cited reference or render the cited reference unsatisfactory for its intended purpose. For at least these reasons, the hypothetical combination of Khuri-Yakub and Watanabe is improper and cannot be made. Accordingly, Appellants respectfully request withdrawal of the foregoing rejections and allowance of the corresponding claims.

In addition, the Examiner has not shown the requisite motivation or suggestion to modify or combine the cited references to reach the present claims. The Examiner must provide objective evidence, rather than subjective belief and unknown authority, of the requisite motivation or suggestion to combine or modify the cited references. In re *Lee*, 61 U.S.P.Q.2d. 1430 (Fed. Cir. 2002). In the present rejection, the Examiner combined the cited references based on the *conclusory and subjective statement* that it would have been obvious "to one of ordinary skill in the art to include a multiplicity of barriers between the sensor elements (2) so as to provide for greater reduction of cross-coupling between the multiplicity of sensor elements." Office Action, page 3, lines 15-18. Accordingly, Appellants respectfully request the Board to reverse the rejection on at least this basis.

Further, the claims depending directly or indirectly from independent claims 1 and 35 are allowable by virtue of their dependency from an allowable base claim, as well as for the subject matter they separately recite. Thus, it is respectfully requested that the rejection of the claims under 35 U.S.C 103(a) be reversed.

Conclusion

Appellants respectfully submit that all pending claims are in condition for allowance. However, if the Examiner or Board wishes to resolve any other issues by way of a telephone conference, the Examiner or Board is kindly invited to contact the undersigned attorney at the telephone number indicated below.

Respectfully submitted,

Date: _____

_____

Patrick S. Yoder
Reg. No. 37,479
FLETCHER YODER
P.O. Box 692289
Houston, TX 77269-2289
(281) 970-4545

8. APPENDIX OF CLAIMS ON APPEAL

Listing of Claims:

1. An optical monitoring system for a plasma enhanced chemical vapor deposition (PECVD) apparatus, comprising:

a light source for generating an input light beam;

a first port configured within the PECVD apparatus for receiving said input light beam from said light source, said first port configured to direct said input beam upon a workpiece within the PECVD apparatus;

a second port configured within the PECVD apparatus for receiving an output light beam passed through said workpiece; and

a comparing mechanism for comparing said output light beam with said input light beam so as to determine a deposited layer thickness upon said workpiece.

2. The system of claim 1, further comprising:

an optical chopper for chopping said input light beam, said input light beam further being split into a first portion and a second portion, said first portion being directed through said first port and said second portion directed to a first optical detector; and

a second optical detector for receiving said output beam from said second port.

3. The system of claim 2, wherein said first port is formed within an upper, radio frequency (RF) electrode assembly of the PECVD apparatus.

4. The system of claim 2, wherein said second port is formed within a lower electrode assembly of the PECVD apparatus.

5. The system of claim 2, wherein said comparing mechanism for comparing further comprises:

a lock-in amplifier for receiving a reference beam signal generated by said first optical detector and an output beam signal generated by said second optical detector, said reference beam signal indicative of the intensity of said input light beam and said output beam signal indicative of the intensity of said output light beam; and

a processor for comparing said reference beam signal and said output light beam signal received by said lock-in amplifier.

6. The system of claim 2, further comprising:

a first collimator coupled to the output of said light source;

a second collimator coupled to the output of said optical chopper; and

a third collimator coupled to a spacer, said spacer providing thermal and RF isolation between said third collimator and a radio frequency (RF) electrode assembly of the PECVD apparatus.

7. The system of claim 2, wherein said PECVD apparatus further comprises:

a radio frequency (RF) electrode assembly disposed within a deposition chamber;

a lower electrode assembly configured to support said workpiece thereon.

8. The system of claim 7, further comprising:

a first spacer in communication with said RF electrode assembly;

a second spacer in communication with said first spacer, said second spacer having a collimator coupled thereto; and

an isolation tube disposed through said RF electrode assembly, said isolation tube located so as to direct said first portion of said input light beam from said optical source through said workpiece.

9. The system of claim 8, wherein said second spacer further comprises:

a tilt plate for directional adjustment of said first portion of said input light beam;

an optical path extension section adjacent said first spacer;

a pressure plate section between said tilt plate and said optical path extension section; and

an optical window sealed between said pressure plate section and said optical path extension section.

10. The system of claim 7, wherein said lower electrode assembly further comprises:

a heatable electrode supporting said workpiece;

a bottom electrode; and

an optical reflector supported by said bottom electrode, wherein said optical reflector is configured to redirect said output beam.

11. A plasma enhanced chemical vapor deposition (PECVD) apparatus, comprising:

a radio frequency (RF) electrode assembly disposed within a deposition chamber;

a lower electrode assembly configured to support a workpiece thereon;

said RF electrode assembly including a first port configured to guide an externally generated input optical beam therethrough and incident upon said workpiece; and

said lower electrode assembly including a second port configured to guide an output optical beam passed through said workpiece out of said deposition chamber.

12. The apparatus of claim 11, further comprising:

a first spacer in communication with said RF electrode assembly;

a second spacer in communication with said first spacer, said second spacer having an input optical source coupled thereto; and

an isolation tube disposed through said RF electrode assembly, said isolation tube located so as to direct an optical beam from said optical source through said workpiece.

13. The apparatus of claim 12, wherein:

a first end of said isolation tube is seated within a recess formed within a top electrode portion of said RF electrode assembly; and

a second end of said isolation tube is sealed against a showerhead of said RF electrode assembly.

14. The apparatus of claim 13, further comprising a screen disposed over said second end of said isolation tube.

15. The apparatus of claim 12, wherein said first spacer further comprises a ceramic spacer.

16. The apparatus of claim 11, wherein said lower electrode assembly further comprises:

a heatable electrode supporting said workpiece;

a bottom electrode; and

an optical reflector supported by said bottom electrode, wherein said optical reflector is configured to redirect said output optical beam.

17. The apparatus of claim 16, wherein said heatable electrode further includes a recess for receiving a removable mask therein, said removable mask having a hole of a selected size therethrough.

18. The apparatus of claim 16, further comprising:

a collimator for receiving said output beam reflected by said optical reflector;

an optical fiber for guiding said output beam from said collimator; and

a vacuum sealed tube for passing said optical fiber out from said deposition chamber.

19. The apparatus of claim 12, wherein said second spacer further comprises:

a tilt plate for directional adjustment of said input optical beam;

an optical path extension section adjacent said first spacer; and

a pressure plate section between said tilt plate and said optical path extension section.

20. The apparatus of claim 19, further comprising an optical window sealed between said pressure plate section and said optical path extension section.

21. A method for optically monitoring a plasma enhanced chemical vapor deposition (PECVD) process, the method comprising:

generating an input light beam;

directing said input light beam through a first port configured within a PECVD apparatus upon a workpiece disposed within the PECVD apparatus;

receiving an output light beam through a second port configured within said PECVD apparatus, said output light beam passed through said workpiece; and

comparing said output light beam with said input light beam so as to determine a deposited layer thickness upon said workpiece.

22. The method of claim 21, further comprising:

chopping said input light beam and splitting said input light beam into a first portion and a second portion, said first portion being directed through said first port and said second portion directed to a first optical detector; and

receiving said output beam from said second port at a second optical detector.

23. The method of claim 22, wherein said comparing further comprises:

receiving, with a lock-in amplifier, a reference beam signal generated by said first optical detector and an output beam signal generated by said second optical detector, said reference beam signal indicative of the intensity of said input light beam and said output beam signal indicative of the intensity of said output light beam; and

comparing, with a processor, said reference beam signal and said output light beam signal received by said lock-in amplifier.

9. EVIDENCE APPENDIX

None.

10. **RELATED PROCEEDINGS APPENDIX**

None.